

CLAIMS

I CLAIM:

1. A reconfigurable optical add-drop multiplexer (ROADM) supporting Optical Multiplex Section shared protection with loopback switching, comprising:

a first optical supervisory module (1W 420), comprising:

a WestIn port (410) for receiving a multichannel signal comprising a first set of Optical Channels;

a 2x1 switch (465) having a first input, a second input, and an output, the first input for receiving a WestIn optical signal, a second input for receiving a small fraction of a loopback copy of an outgoing Optical Multiplex Section, the loopback copy comprising the multichannel signal having the first set of Optical Channels, the 2x1 switch selecting either the first input or the second input for generating to the output of the 2x1 switch;

an optical tap (466) having an input, a first output, and a second output, the optical tap tapping a portion of the multichannel signal that is used to determine the presence or absence of an incoming signal to the first output, the first output of the optical tap coupled to the second input of the 2x1 switch;

an 1x1 switch (460) having an input coupled to the output of the second output of the optical tap and output;

a WestOut port (415) coupled to the output of the 1x1 switch;

an amplifier module (430) having an input coupled to the output of the 2x1 module, and an output; and

a broadcast and select module having a first input coupled to the output of the amplifier module, a second input, and an output coupled to the input of the optical tap.

2. The ROADM of Claim 1, further comprising .

a second optical supervisory module (1E 425), comprising:

an EastIn port (411) for receiving a multichannel signal comprising a first set of Optical Channels;

a 2x1 switch (475) having a first input, a second input, and an output, the first input for receiving an EastIn optical signal, a second input for receiving a small fraction of a loopback copy of an outgoing Optical Multiplex Section, the loopback copy comprising the multichannel signal having the first set of Optical Channels, the 2x1 switch selecting either the first input or the second input for generating to the output of the 2x1 switch;

an optical tap (476) having an input, a first output, and a second output, the optical tap tapping a portion of the multichannel signal that is used to determine the presence or absence of an incoming signal to the first output, the first output of the optical tap coupled to the second input of the 2x1 switch;

an 1x1 switch (470) having an input coupled to the output of the second output of the optical tap and output;

an EastOut port (416) coupled to the output of the 1x1 switch;

an amplifier module (435) having an input coupled to the output of the 2x1 module, and an output; and

a broadcast and select module having a first input coupled to the output of the amplifier module, a second input, and an output coupled to the input of the optical tap.

3. The ROADM of Claim 2, further comprising a multiplexer/demultiplexer module (4W 450) coupled to the broadcast and select module (440).

4. The ROADM of Claim 3, further comprising a multiplexer/demultiplexer module (4E 455) coupled to the broadcast and select module (445).

5. A reconfigurable optical add-drop multiplexer supporting Optical Multiplex Section shared protection with loopback switching, comprising:

- a first optical supervisory module (1W 420), comprising:

- a WestIn port (410) for receiving a multichannel signal comprising a first set of Optical Channels;

- a 2x1 switch (465) having a first input, a second input, and an output, the first input for receiving a WestIn optical signal, a second input for receiving a small fraction of a loopback copy of an outgoing Optical Multiplex Section, the loopback copy comprising the multichannel signal having the first set of Optical Channels, the 2x1 switch selecting either the first input or the second input for generating to the output of the 2x1 switch;

- an optical tap (466) having an input, a first output, and a second output, the optical tap tapping a portion of the multichannel signal that is used to determine the presence or absence of an incoming

signal to the first output, the first output of the optical tap coupled to the second input of the 2x1 switch;

an 1x1 switch (460) having an input coupled to the output of the second output of the optical tap and output;

a WestOut port (415) coupled to the output of the 1x1 switch;

a pre-amplifier (510) having an input coupled to the output of the 2x1 module, and an output;

a broadcast and select module having a first input coupled to the output of the amplifier module, a second input, and an output coupled to the input of the optical tap; and

a booster amplifier having an input coupled to the broadcast and select module and an output coupled to the optical tap.

6. The ROADM of Claim 5, further comprising

a second optical supervisory module (1E 425), comprising:

an EastIn port (411) for receiving a multichannel signal comprising a first set of Optical Channels;

a 2x1 switch (475) having a first input, a second input, and an output, the first input for receiving an EastIn optical signal, a second input for receiving a small fraction of a loopback copy of an outgoing

Optical Multiplex Section, the loopback copy comprising the multichannel signal having the first set of Optical Channels, the 2x1 switch selecting either the first input or the second input for generating to the output of the 2x1 switch;

an optical tap (476) having an input, a first output, and a second output, the optical tap tapping a portion of the multichannel signal that is used to determine the presence or absence of an incoming signal to the first output, the first output of the optical tap coupled to the second input of the 2x1 switch;

an 1x1 switch (470) having an input coupled to the output of the second output of the optical tap and output;

an EastOut port (416) coupled to the output of the 1x1 switch;

a pre-amplifier (520) having an input coupled to the output of the 2x1 module, and an output;

a broadcast and select module(445) having a first input coupled to the output of the amplifier module, a second input, and an output coupled to the input of the optical tap; and

a booster amplifier (526) having an input coupled to the broadcast and select module (525) and an output coupled to the optical tap (476).

7. The ROADM of Claim 5, further comprising a mid-stage loss coupled (515) between the broadcast and select module (440) and the booster amplifier (516).

8. The ROADM of Claim 5, further comprising a mid-stage loss coupled (525) between the broadcast and select module (445) and the booster amplifier (526).

9. The ROADM of Claim 5, further comprising a multiplexer/demultiplexer module (4W 450) coupled to the broadcast and select module (440).

10. The ROADM of Claim 5, further comprising a multiplexer/demultiplexer module (4E 455) coupled to the broadcast and select module (445).

11. A reconfigurable optical add-drop multiplexer (ROADM), comprising:

a first optical supervisory module, comprising:

an input port A_{in} for receiving a multichannel signal comprising a first set of Optical Channels;

a first 2x1 switch having a first input, a second input, and an output, the first input for receiving an input port A optical signal, a second input for receiving a small fraction of a loopback copy of an outgoing Optical Multiplex Section, the loopback copy comprising the multichannel signal having the first set of Optical Channels, the first 2x1 switch selecting either the first input or the second input for generating to the output of the first 2x1 switch;

a first optical tap having an input, a first output, and a second output, the optical tap tapping a portion of the multichannel signal that is used to determine the presence or absence of an incoming signal to the first output, the first output of the optical tap coupled to the second input of the first 2x1 switch;

a first 1x1 switch having an input coupled to the output of the second output of the optical tap and output;

an output port Aout coupled to the output of the first 1x1 switch;

an amplifier means having an input coupled to the output of the 2x1 module, and an output; and

a broadcast and select module having a first input coupled to the output of the amplifier means, a second input, and an output coupled to the input of the optical tap.

12. The ROADM of Claim 11, wherein the first optical supervisory module comprises a West optical supervisory module.

13. The ROADM of Claim 11, wherein the first optical supervisory module comprises an East optical supervisory module.

14. An automatic protection switching (APS) controller method for OMS shared protection in a ROADM, comprising:

receiving a triggering input signal for protection switching;

generating a switching command output to a 2x1 switch within an optical supervisory channel; and

sending a command to deactivate or reactivate one or more optical receivers locally configured to receive extra traffic, wherein under a failure condition, one or more extra traffic receivers are deactivated when an OMS signal is looped back within a ROADM to present a drop signal via a broadcast and select module.

15. The APS of Claim 14, wherein in the sending step, comprises the extra traffic being carried on one or more Optical Channels that use spare protection wavelengths under a normal condition.

16. The APS of Claim 14, wherein in the sending step, comprises the extra traffic being pre-empted under the failure condition.

17. The APS of Claim 14, further comprising transmitting a message to other nodes via the optical supervisory channel.

18. The APS of Claim 14, wherein the receiving step comprises a locally detected signal fault, a manually initiated command, or a bridge request from another node.